NASA Advisory Council Recommendation

Allocation of Resources for International Space Station (ISS) Research Required for the Journey to Mars
2016-01-01 (Council-01)

Recommendation:
The Council recommends that NASA conduct an internal evaluation of the top priority ISS research directly related to the Journey to Mars and determine whether some portion of the resources (including crew time, up-mass, and dollars) applied to the ISS National Laboratory could be used to more rapidly advance the Journey to Mars.

Major Reasons for Proposing the Recommendation:
As articulated by the NASA Administrator and various NASA public documents, the Journey to Mars is NASA's top Exploration Goal.

Research for the Journey to Mars that utilizes the ISS must be concentrated in the next eight years, before NASA's Human Exploration focus shifts away from ISS utilization. Beyond the operational funding, launch up-mass and crew time for ISS research are the most limited resources.

The Council notes that the ISS National Laboratory has been allocated launch up-mass and at least 50% of ISS crew time for research that may eventually have potential for commercial benefits. The Council has also been told by NASA that a successful transition from the "Earth Reliant" phase to the "Proving Ground" phase is dependent at least in part on the success of attracting future commercial users of the ISS and/or the availability of commercial Low Earth Orbit (LEO) laboratory capability that NASA could use. The Council therefore believes that it would be beneficial for the Agency to better understand the effect that the resources being devoted to the ISS National Laboratory might have on the important research needed to reduce technology and human health risk for the Journey to Mars.

As additional information, we provide a section of the original legislation that allows for the allocation to the ISS National Laboratory to be altered as needed (see footnote below).

Consequences of No Action on the Proposed Recommendation:
The Journey to Mars may be delayed as resources are deployed for commercialization.

NASA Response:
NASA concurs with the recommendation. Research planning for upcoming ISS Increment pairs normally includes a prioritization effort in which research identified as "NASA-Exploration-Critical" is assigned the highest priority activity for NASA's resources (see the attached example for the upcoming increment pair 51-52.) To date, research investigations in the "NASA-Exploration-Critical" category have not

exceeded the resources available for NASA investigations, and it has not been necessary to use the research resources allocated by the Act for non-NASA activities, through the mechanism provided by the Act, to conduct any "NASA-Exploration-Critical" research. If in the future this situation arises, the NASA liaison will, as the NASA Authorization Act of 2010 (Public Law 111-267) describes, discuss the situation with the Center for the Advancement of Science and Space (CASIS), and a solution in the best interests of the space program will be sought.

Section 504(d)(2) of the NASA Authorization Act of 2010, Public Law 111-267 *(bolded portion below added for emphasis:*

(d) RESEARCH CAPACITY ALLOCATION AND NTEGRATION OF RESEARCH PAYLOADS.

(2) ADDITIONAL RESEARCH CAPABILITIES.- If any NASA Research plan is determined to require capacity onboard the ISS beyond the percentage allocated under paragraph (1), such research plan shall be prepared in the form of a requested research opportunity to be submitted to the process established under this section for the consideration of proposed research within the capacity allocated to the ISS National Laboratory. A proposal for such a research plan may include the establishment of partnerships with non-NASA institutions eligible to propose research to be conducted within the ISS National Laboratory capacity. **Until September 30, 2020, the official or employee designated under subsection (b) may grant an exception to this requirement in the case of a proposed experiment considered essential for purposes of preparing for exploration beyond low-Earth orbit, as determined by joint agreement between the organization with which the Administrator enters into a cooperative agreement under subsection (a) and the official or employee designated under subsection (b).**

[NOTE: The "official or employee designated under subsection (b)" is the NASA Liaison, Mr. Samuel Scimemi, Director, International Space Station Division, NASA Headquarters.]

Preliminary Increment 51/52 Utilization

NASA Research Office – Science Mission Directorate	Earth and Space Science-Earth Remote Sensing	Cloud-Aerosol Transport System (CATS)	External-High-A
NASA Research Office – Science Mission Directorate	Earth and Space Science-Astrophysics	Cosmic Ray Energetics and Mass (CREAM)	External-High-A
NASA Research Office – Science Mission Directorate	Earth and Space Science-Astrophysics	Neutron Star Interior Composition Explorer (NICER)	External-High-A
NASA Research Office – Science Mission Directorate	Earth and Space Science-Earth Remote Sensing	RapidScat	External-High-A
NASA Research Office – Science Mission Directorate	Earth and Space Science-Earth Remote Sensing	Stratospheric Aerosol and Gas Experiment III (SAGE III)	External-High-A
NASA Research Office – Science Mission Directorate	Technology Development and Demonstration-Spacecraft and Orbital Environments	Space Test Program-Houston-5 Lightning Imaging Sensor (STP-H5 (LIS))	External-High-A
Technology Demonstration Office	Technology Development and Demonstration-Characterizing Experiment Hardware	Roll-Out Solar Array (ROSA)	External-High-A
Technology Demonstration Office	Technology Development and Demonstration-Communication and Navigation	Space Communications and Navigation (Scan Testbed)	External-High-A

Preliminary Increment 51/52 Utilization

Technology Demonstration Office	Technology Development and Demonstration-Spacecraft and Orbital Environments	Space Test Program-Houston (STP-H5)	External-High-A
Technology Demonstration Office	Technology Development and Demonstration-Imaging Technology	High Definition Earth Viewing (HDEV)	External-High-B
Human Research Program	Human Research-Integrated Physiology and Nutrition	Biochemical Profile	NASA-Expl.-Critical
Human Research Program	Human Research-Habitability and Human Factors	Body Measures	NASA-Expl.-Critical
Human Research Program	Human Research-Cardiovascular and Respiratory Systems	Cardio Ox	NASA-Expl.-Critical
Human Research Program	Human Research-Integrated Physiology and Nutrition	Dose Tracker	NASA-Expl.-Critical
Human Research Program	Human Research-Integrated Physiology and Nutrition	Fine Motor Skills	NASA-Expl.-Critical
Human Research Program	Human Research-Vision	Fluid Shifts	NASA-Expl.-Critical
Human Research Program	Human Research-Immune System	Functional Immune	NASA-Expl.-Critical
Human Research Program	Human Research-Habitability and Human Factors	Habitability	NASA-Expl.-Critical

Preliminary Increment 51/52 Utilization

Human Research Program	Facility	Human Research Facility (HRF Rack 1 and 2)	NASA-Expl.-Critical
Human Research Program	Human Research-Human Behavior and Performance	Lighting Effects	NASA-Expl.-Critical
Human Research Program	Human Research-Nervous and Vestibular Systems	NeuroMapping	NASA-Expl.-Critical
Human Research Program	Human Research-Integrated Physiology and Nutrition	Rx Metabolism	NASA-Expl.-Critical
Human Research Program	Human Research-Bone and Muscle Physioloigy	Sprint	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Space Structures	Bigelow Expandable Activity Module (BEAM)	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Life Support Systems and Habitation	Capillary Structures for Exploration Life Support	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Life Support Systems and Habitation	Long Duration Sorbent Testbed (LDST)	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Life Support Systems and Habitation	Miniature Exercise Device-2 (MED-2)	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Thermal Management Systems	Passive Thermal Flight Experiment	NASA-Expl.-Critical

Preliminary Increment 51/52 Utilization

Technology Demonstration Office	Technology Development and Demonstration-Thermal Management Systems	Phase Change Heat Exchanger (Phase Change HX)	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Fire Suppression and Detection	Spacecraft Fire III (Saffire-III)	NASA-Expl.-Critical
Technology Demonstration Office	Technology Development and Demonstration-Air, Water and Surface Monitoring	Water Quality Monitoring Suite	NASA-Expl.-Critical
Space Life and Physical Sciences Research and Applications	Physical Science-Complex Fluids	Advanced Colloids Experiment-Temperature-9 (ACE-T9 (Marr))	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Plant Biology	Biological Research in Canisters - 22 (BRIC-22)	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Plant Biology	Biological Research in Canisters - Light Emitting Diode (BRIC-LED)	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Physical Science-Fundamental Physics	Cold Atom Lab (CAL)	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Earth and Space Science-Life Support Systems and Habitation	Cool Flames	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Plant Biology	European Modular Cultivation System-2 (EMCS-2)	NASA-Recommended

Preliminary Increment 51/52 Utilization

Space Life and Physical Sciences Research and Applications	Physical Science-Materials Science	Electromagetic Levitator Batch 2 (EML Batch 2 (ESA))	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Physical Science-Materials Science	Materials Science Laboratory Sample Cartridge Assembly (MSL SCA – batch 2b (ESA))	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Microbiology	(Microbial Tracking-2) MT-2	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Plant Biology	Veg Unit #2	NASA-Recommended
Space Life and Physical Sciences Research and Applications	Physical Science-Fluid Physics	Zero Boil-Off Tank (ZBOT)	NASA-Recommended
Technology Demonstration Office	Technology Development and Demonstration-Robotics	Gecko Gripper	NASA-Recommended
Technology Demonstration Office	Technology Development and Demonstration-Radiation Measurements and Shielding	Miniaturized Particle Telescope	NASA-Recommended
Technology Demonstration Office	Technology Developnent and Demonstration-Air, Water and Surface Monitoring	Personal CO2 Monitor	NASA-Recommended
Technology Demonstration Office	Technology Development and Demonstration-Radiation Measurements and Shielding	Radiation Environment Monitor (REM)	NASA-Recommended

Preliminary Increment 51/52 Utilization

Technology Demonstration Office	Technology Development and Demonstration-Spacecraft and Orbital Environments	Radio Frequency Identification Logistics Awareness (RFID Logistics Awareness)	NASA-Recommended
Technology Demonstration Office	Technology Development and Demonstration-Robotics	Robonaut	NASA-Recommended
Technology Demonstration Office	Technology Development and Demonstration-Propulsion Systems	Slosh Coating	NASA-Recommended
Technology Demonstration Office	Technology Development and Demonstration-Physical Science	Strata-1	NASA-Recommended
Human Research Program	Human Research-Crew Healthcare Systems	Medical Consumables Tracking	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Complex Fluids	Advanced Colloids Experiment-Temperature-8 (ACE-T8 (Weitz))	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Combustion Science	Advanced Combustion Microgravity Experiment (ACME)	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Plant Biology	Advanced Plant Experiments-05 (APEX-05)	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Combustion Science	Burning and Suppression of Solids - II (BASS-II)	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Biology and Biotechnology-Cellular Biology	Capillary Flow Experiment - 2 (CFE-2) Vane Gap-1 (VG-1)	NASA-Reserve

Preliminary Increment 51/52 Utilization

Space Life and Physical Sciences Research and Applications	Physical Science-Fluid Physics	Capillary Flow Experiment - 2 (CFE-2) Vane Gap-2 (VG-2)	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Complex Fluids	DEvice for the study of Critical LIquids and Crystallization - Alice Like Insert-Refurbishment (DECLIC-ALI-R (CNES))	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Materials Science	DEvice for the study of Critical LIquids and Crystallization - Directional Solidification Insert-Reflight (DECLIC-DSI-R (CNES))	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Fluid Physics	DEvice for the study of Critical LIquids and Crystallization - High Temperature Insert-Reflight Supercritical Water Mixture (DECLIC-HTI-R (SCWM) (CNES))	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Materials Science	Materials Science Laboratory Sample Cartridge Assembly (MSL SCA-GEDS (German))	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Materials Science	Materials Science Laboratory Sample Cartridge Assembly (MSL SCA-ICESAGE (Volz))	NASA-Reserve
Space Life and Physical Sciences Research and Applications	Physical Science-Fluid Physics	WetLab-2 (WL-2)	NASA-Reserve
Technology Demonstration Office	Technology Development and Demonstration-Avionics and Software	Telescience Resource Kit (TReK)	NASA-Reserve

Preliminary Increment 51/52 Utilization

Technology Demonstration Office	Technology Development and Demonstration-Life Support Systems and Habitation	Ultrasonic Background Noise Test (UBNT)	NASA-Reserve
Human Research Program	Human Research-Nervous and Vestibular Systems	Field Test	NASA-Xcluded
Human Research Program	Human Research-Bone and Muscle Physioloigy	Intervertebral Disc Damage (IVD)	NASA-Xcluded
Human Research Program	Human Research-Integrated Physiology and Nutrition	Repository	NASA-Xcluded
Human Research Program	Human Research-Integrated Physiology and Nutrition	Telomeres	NASA-Xcluded
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Earth and Space Science-Astrophysics	Alpha Magnetic Spectrometer-02 (AMS-02)	National Lab-External
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Earth and Space Science-Earth Remote Sensing	Deutsches Zentrum für Luft- und Raumfahrt (DLR) Earth Sensing Imaging Spectrometer (DESIS)	National Lab-External

Preliminary Increment 51/52 Utilization

National Lab Office - CASIS (Center for the Advancement of Science in Space)	Multipurpose-ISS External Platform	Multiple User System for Earth Sensing (MUSES)	National Lab-External
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Educational Activities and Outreach-Educational Demonstrations	International Space Station Ham Radio Amateur Radio on the International Space Station (ISS Ham Radio - ARISS)	National Lab-Educational
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Educational Activities and Outreach-Educational Demonstrations	Sally Ride Earth Knowledge Acquired by Middle School Students (Sally Ride EarthKAM)	National Lab-Educational
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Educational Activities and Outreach-Educational Competitions	Synchronized Position Hold, Engage, Reorient, Experimental Satellites-Zero-Robotics (SPHERES-Zero-Robotics)	National Lab-Educational
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Complex Fluids	Advanced Colloids Experiment-Temperature-6 (ACE-T-6)	National Lab-High

Preliminary Increment 51/52 Utilization

National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Fluid Physics	Capillary Driven Microfluidics	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Cellular Biology	Cardiac Stem Cells	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Educational Activities and Outreach-Student-Developed Investigations	CASIS National Design Challenge 5 - CASIS Education 4 (CASIS NDC 5 (CASIS Edu 4))	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Macromolecular Crystal Growth	CASIS Protein Crystal Growth 6 (CASIS PCG 6)	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Macromolecular Crystal Growth	CASIS Protein Crystal Growth 7 (CASIS PCG 7)	National Lab-High

Preliminary Increment 51/52 Utilization

National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Macromolecular Crystal Growth	CASIS Protein Crystal Growth 8 (CASIS PCG 8)	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Cellular Biology	CellSqueeze Platform	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Fluid Physics	Electrolysis Measurement	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Cellular Biology	Lung Cells	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Technology Development and Demonstration-Communication and Navigation	Maritime Awareness	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Materials Science	Microgravity Enhanced Electrical Performance (MEEP)	National Lab-High

Preliminary Increment 51/52 Utilization

National Lab Office - CASIS (Center for the Advancement of Science in Space)	Earth and Space Science-Astrobiology	Meteor	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Earth and Space Science-Earth Remote Sensing	NanoRacks External Platform, NanoRacks CubeSats Deployer, Microsatellite (NREP, NRCSD, MicroSat)	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	TBD	NanoRacks Modules	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Materials Science	Nemak Alloys	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	TBD	Novopyxis (under NR Modules)	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Plant Biology	Petri Plants-2	National Lab-High

Preliminary Increment 51/52 Utilization

National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Animal Biology-Vertebrates	Rodent Research-5 (RR-5)	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Technology Development and Demonstration-Avionics and Software	SG100 Cloud Computer (SCCP)	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	TBD	Space Tango Payload Cards	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Biology and Biotechnology-Cellular Biology	Synthetic Bone	National Lab-High
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Materials Science	Zirconium, Barium, Lanthanum, Aluminum, and Sodium Optical Fibers (Zblan Optical Fibers)	National Lab-High

Preliminary Increment 51/52 Utilization

National Lab Office - CASIS (Center for the Advancement of Science in Space)	Physical Science-Fluid Physics	BioChip Spacelab	National Lab-Medium
National Lab Office - CASIS (Center for the Advancement of Science in Space)	Multipurpose-Lab Centrifuge	Multi-purpose Variable-g Platform (MVP)	National Lab-Medium
Human Research Program	N/A	Crew time contribution for Sarcolab-3 (Joint MARES protocol)	TBD